

Planetary Data System

PDS4 Information Model: A Data Model for Planetary Data Archive Implementing the OAIS Standard

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Topics

- ISO standards for trustworthy long-term digital repositories
- The Planetary Data System
 - The PDS4 Information Model
- ISO Compliance



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ISO Standards

- ISO 14721:2012 - A Reference Model for an Open Archival Information System (OAIS)
 - The reference model for what is required for an archive to provide long-term preservation of digital information.



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Key Principles of the OAIS Reference Model

- Repository must define the designated community and the associated knowledge base
- Repository must obtain the following categories of information
 - **Identification** – allows information object to be discovered and accessed.
 - **Representation/Format** - allows a data object to be interpreted.
 - **Fixity** - ensures the information object has not been unintentionally altered.
 - **Provenance** – essential for authenticity
 - **Context** - describes the environment in which the data object was created.
 - **Reference** - allows the information objects to be referenced.
 - **Access Rights** - identifies the access restrictions pertaining to the data



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ISO Standards

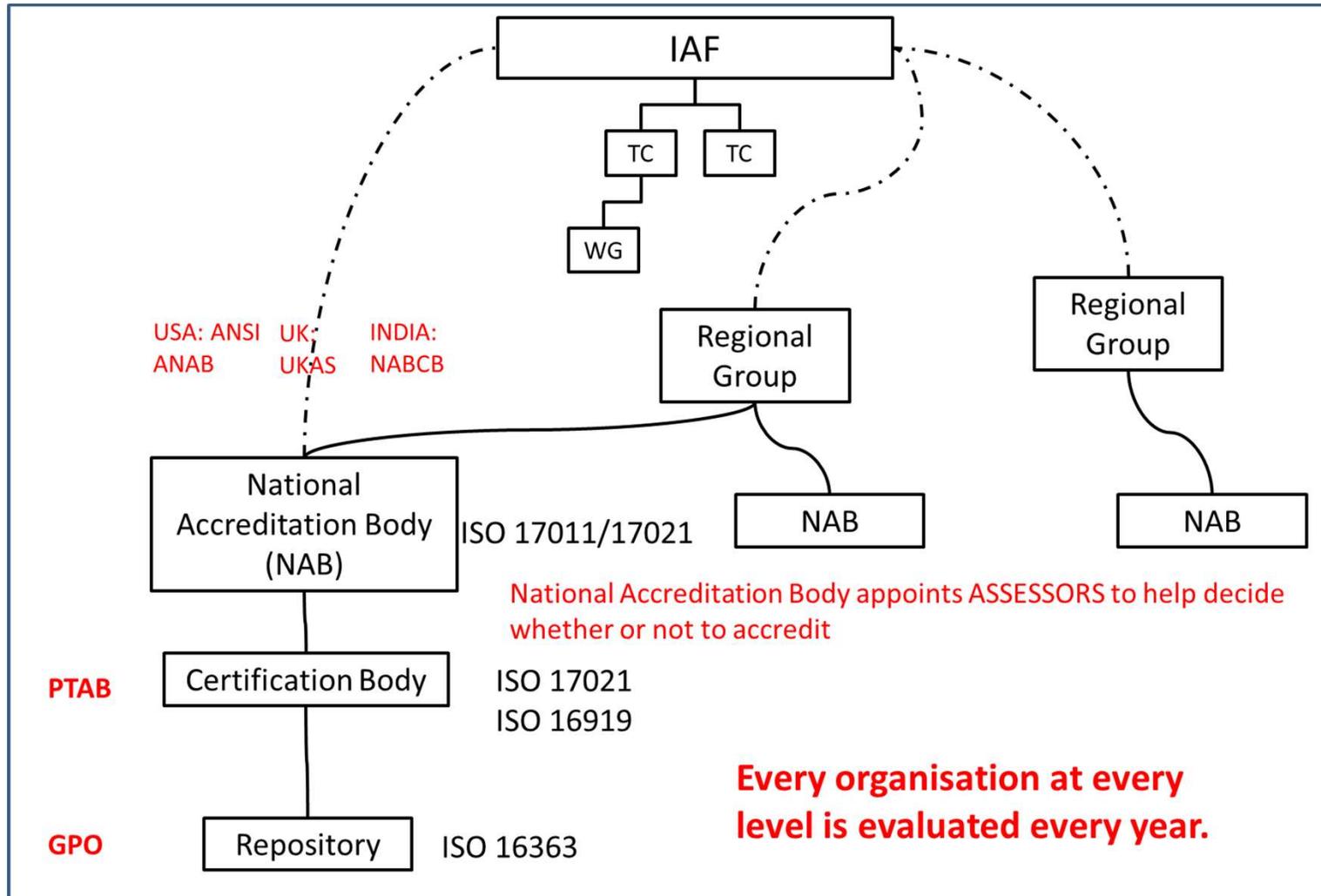
- ISO 16363:2012 - Audit and certification of trustworthy digital repositories.
 - Sets out comprehensive metrics for what an archive must do, based on OAIS, covering Organizational Infrastructure, Digital Object Management, and Infrastructure and Security Risk Management.
- ISO 16919:2014 - Requirements for bodies providing audit and certification of candidate trustworthy digital repositories
 - Specifies the competencies and requirements for auditors and serves as an extension to ISO/IEC 17021 Requirements for bodies providing audit and certification of management systems, providing additional requirements specific to auditing Trustworthy Digital Repositories.



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Certification Bodies





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ISO Standards

- ISO/IEC 11179 - Metadata Registry (MDR) standard
 - An international standard for representing metadata for an organization in a metadata registry.

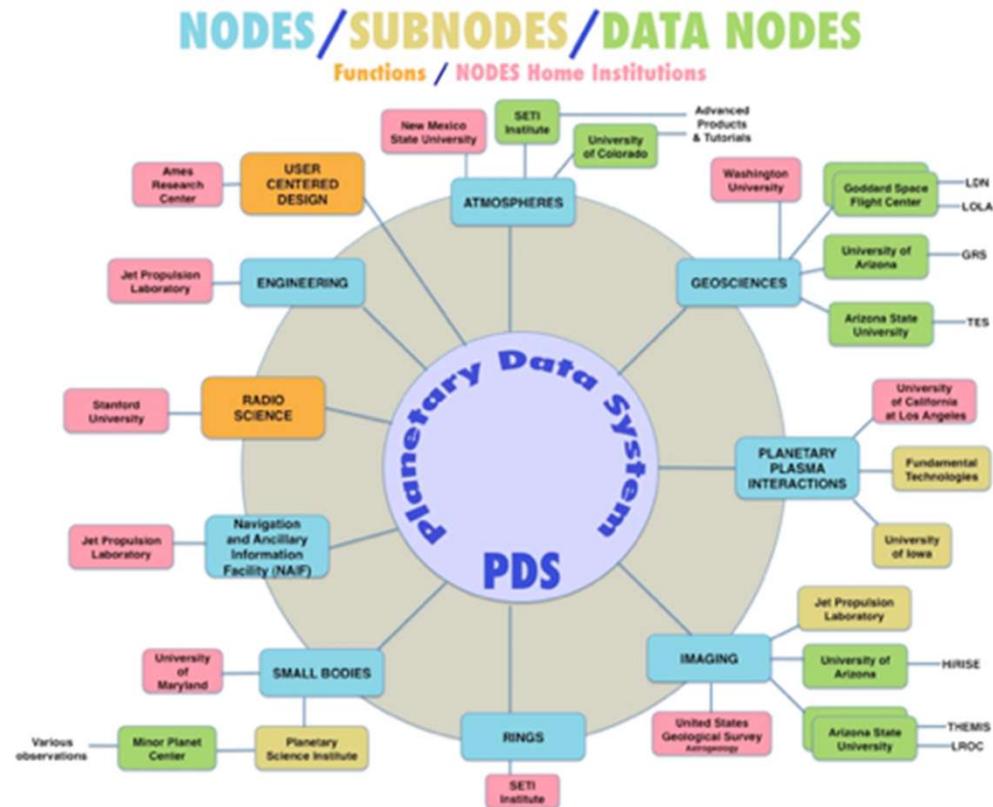


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Planetary Data System

- The Planetary Data System (PDS) is a federation of planetary science discipline nodes
- A response to the findings of the Committee on Data Management and Computing (CODMAC 1986)



Mission: To “facilitate achievement of NASA’s planetary science goals by efficiently collecting, archiving, and making accessible digital data and documentation produced by or relevant to NASA’s planetary missions, research programs, and data analysis programs.” 8

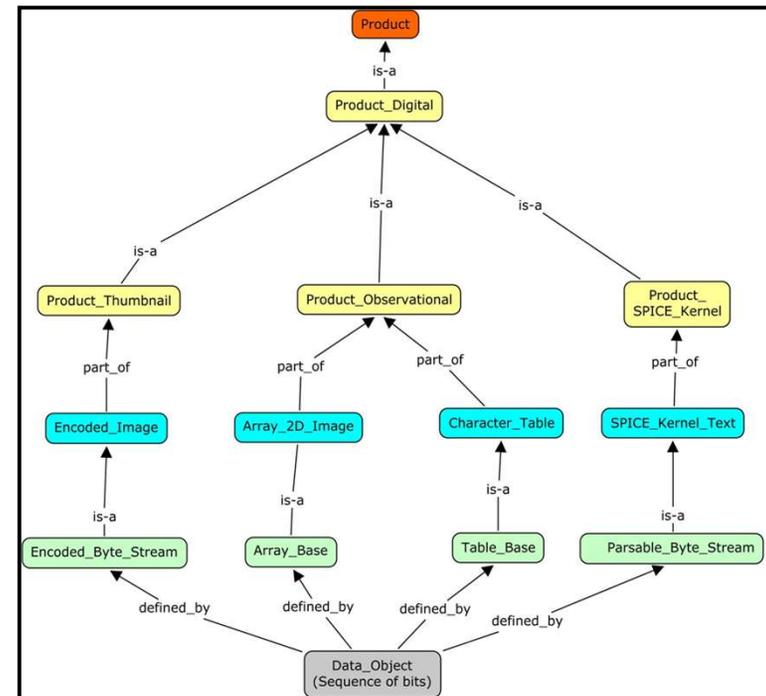
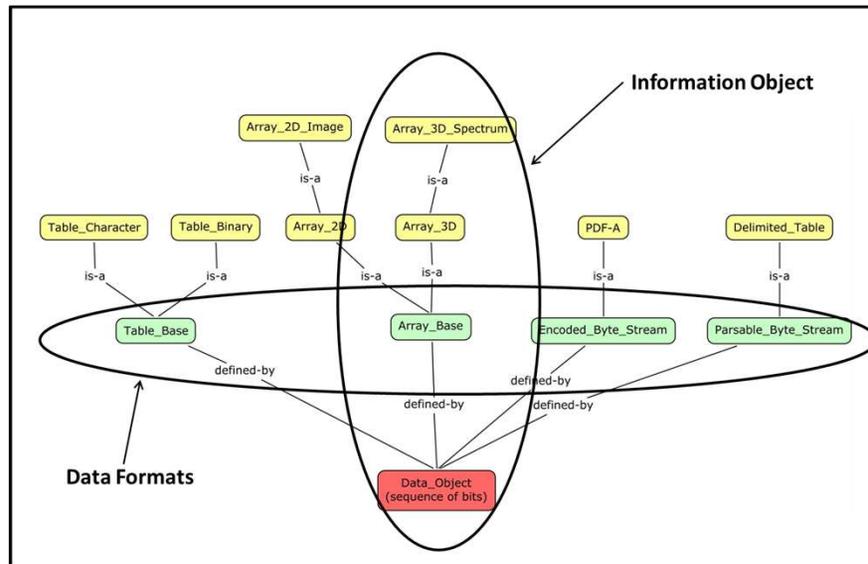


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The PDS4 Information Model

- Defines and provides templates for capturing
 - data structure (format)
 - context within which the data was captured, processed, and archived
 - the relationships between the data



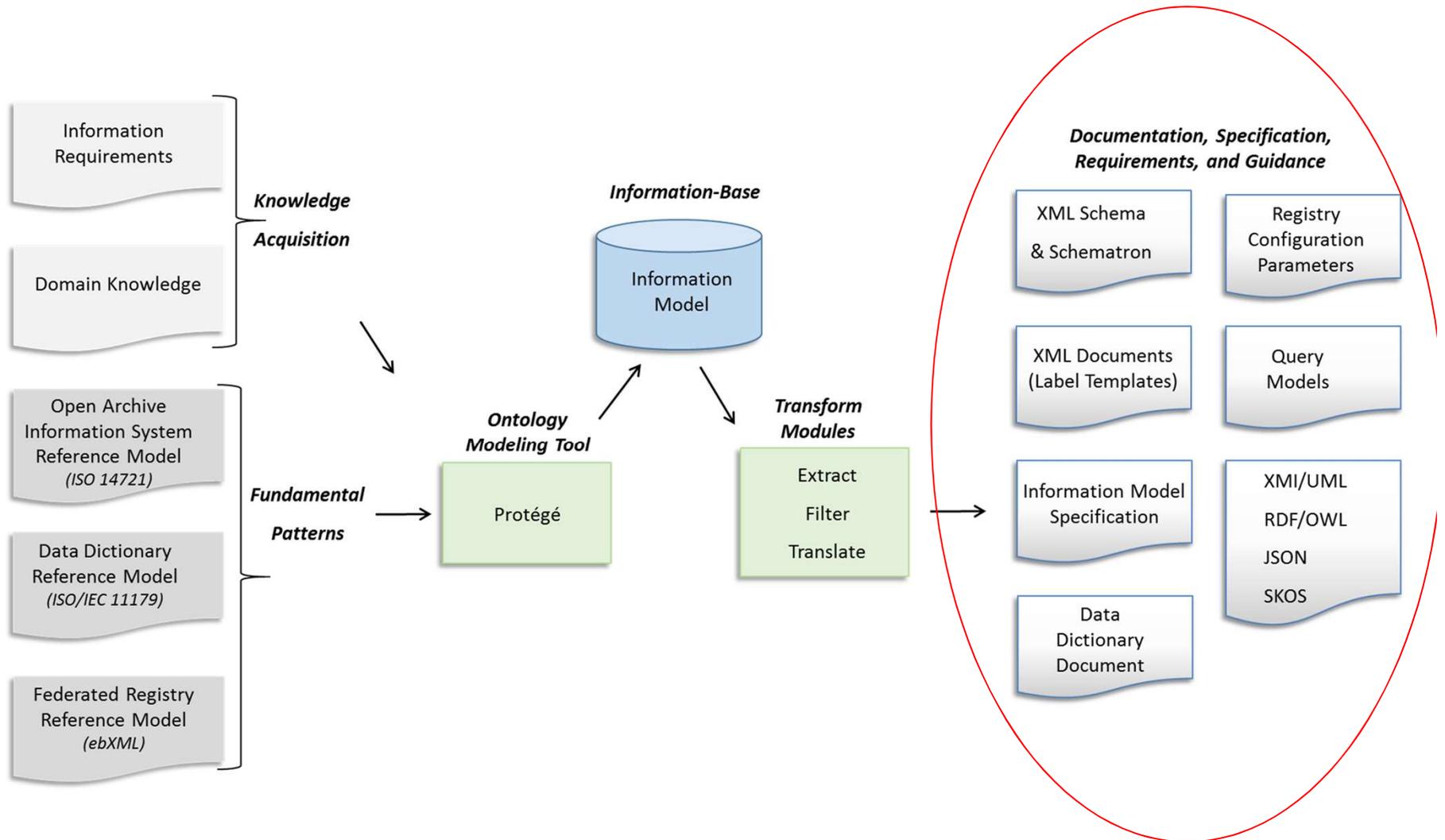
- The single authoritative source for:
 - *The System's Data Standards.*
 - *The System's Data Requirements*
 - registration, search, retrieval, process, analysis, and long-term preservation



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Artifacts Generated From Model





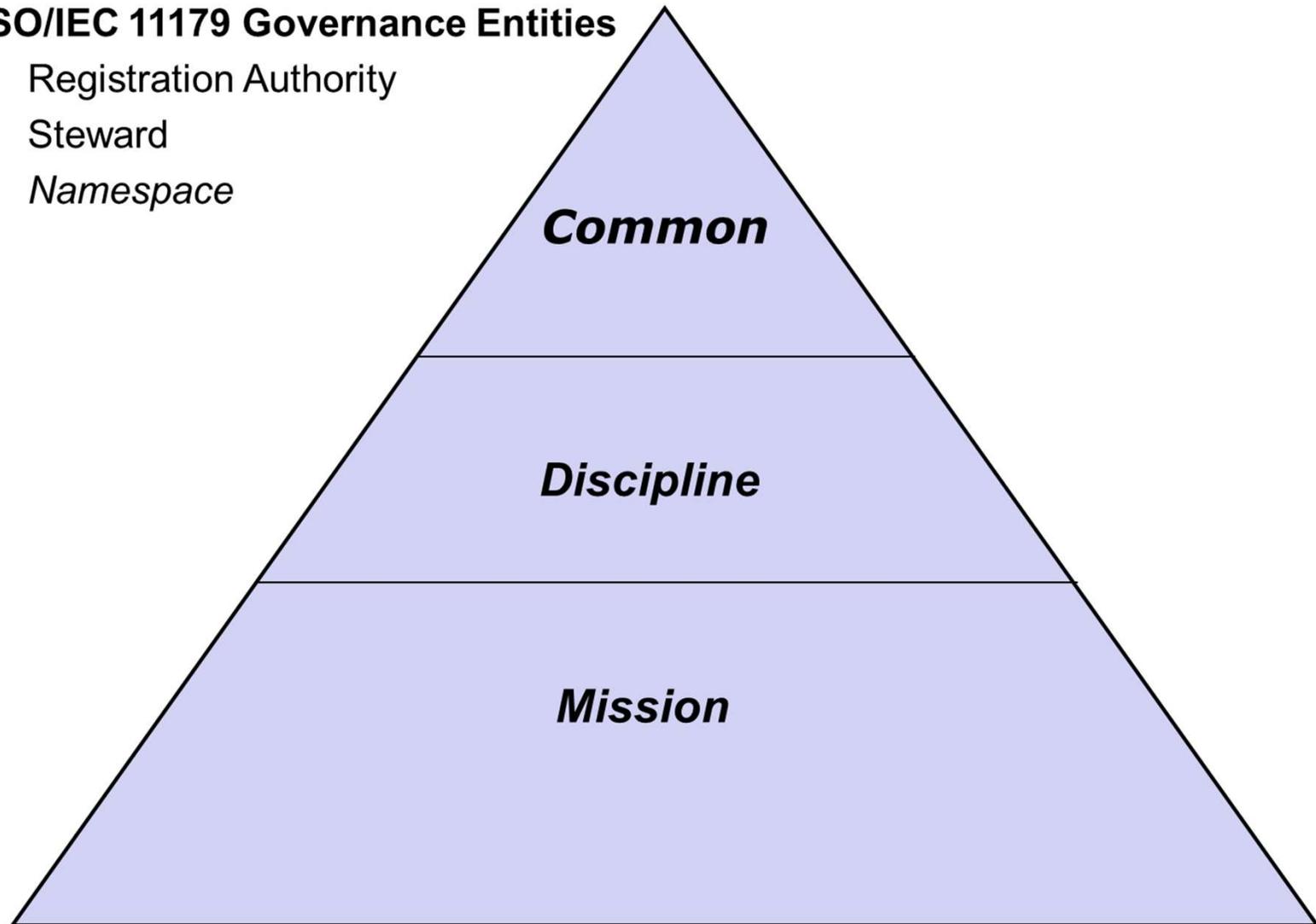
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Multi-level Governance

ISO/IEC 11179 Governance Entities

- Registration Authority
- Steward
- *Namespace*

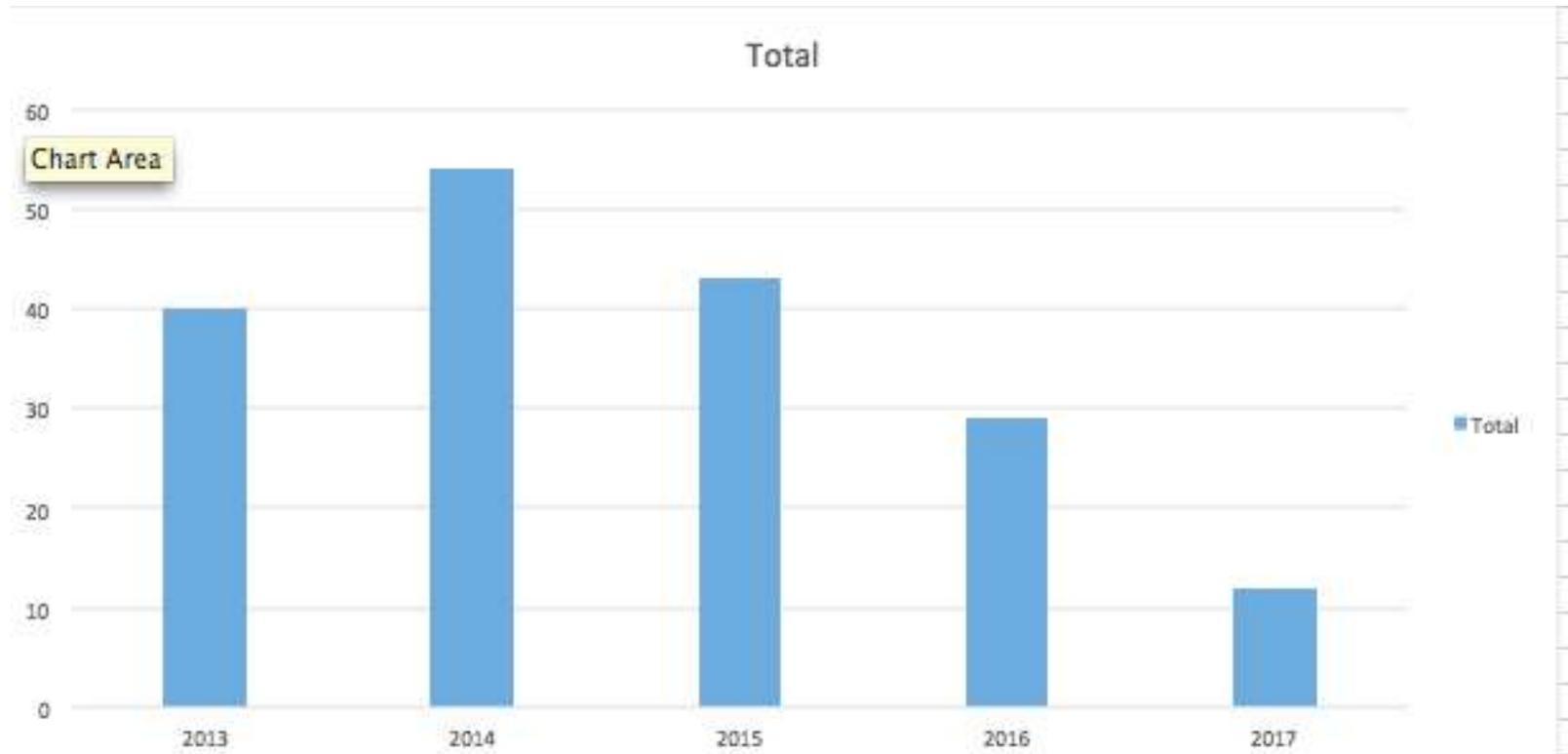




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SCR metrics over time Common Dictionary





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Model Components

Common, Discipline and Mission Dictionaries

Registration Authority	Steward Id	Namespace Id*	XML Schema Namespace	Logical Identifier Prefix	Governance Level	Steward	Oversight
0001_NASA_PDS_1	pds	pds	http://pds.nasa.gov/pds4/pds/v1	urn:nasa:pds:	Common	PDS EN Node*****	CCB
0001_NASA_PDS_1	atm	atm	http://pds.nasa.gov/pds4/atm/v1	urn:nasa:pds:	Discipline	PDS ATM Node	
0001_JAXA_DARTS_1	darts	darts	http://pds.nasa.gov/pds4/darts/v1	urn:jaxa:darts:	Discipline	DARTS (JAXA)	
0001_NASA_PDS_1	en	dph	http://pds.nasa.gov/pds4/dph/v1	urn:nasa:pds:	Discipline	PDS EN Node	
0001_NASA_PDS_1	geo	geo	http://pds.nasa.gov/pds4/geo/v1	urn:nasa:pds:	Discipline	PDS GEO Node	
0001_NASA_PDS_1	geo	geom	http://pds.nasa.gov/pds4/geom/v1	urn:nasa:pds:	Discipline	PDS GEO Node	
0001_NASA_PDS_1	img	cart	http://pds.nasa.gov/pds4/cart/v1	urn:nasa:pds:	Discipline	PDS IMG Node	
0001_NASA_PDS_1	img	disp	http://pds.nasa.gov/pds4/disp/v1	urn:nasa:pds:	Discipline	PDS IMG Node	
0001_NASA_PDS_1	img	img	http://pds.nasa.gov/pds4/img/v1	urn:nasa:pds:	Discipline	PDS IMG Node	
0001_NASA_PDS_1	naif	naif	http://pds.nasa.gov/pds4/naif/v1	urn:nasa:pds:	Discipline	PDS NAIF Node	
0001_NASA_PDS_1	ops	pds	http://pds.nasa.gov/pds4/pds/v1	urn:nasa:pds:	Discipline	PDS EN Node	
0001_NASA_PDS_1	ppi	alt	http://pds.nasa.gov/pds4/alt/v1	urn:nasa:pds:	Discipline	PDS PPI Node	
0001_NASA_PDS_1	ppi	particle	http://pds.nasa.gov/pds4/particle/v1	urn:nasa:pds:	Discipline	PDS PPI Node	
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0001_NASA_PDS_1	ppi	wave	http://pds.nasa.gov/pds4/wave/v1	urn:nasa:pds:	Discipline	PDS PPI Node	
0001_ESA_PSA_1	psa	psa	http://psa.esa.int/psa/v1	urn:psa:esa:	Discipline	ESA PSA	
0001_NASA_PDS_1	rings	rings	http://pds.nasa.gov/pds4/rings/v1	urn:nasa:pds:	Discipline	PDS Rings Node	
0001_NASA_PDS_1	rs	rs	http://pds.nasa.gov/pds4/rs/v1	urn:nasa:pds:	Discipline	PDS RS Node	
0001_ROS_RSSA_1	rssa	rssa	http://pds.nasa.gov/pds4/rssa/v1	urn:ros:rssa:	Discipline	RSSA (IKI)	
0001_NASA_PDS_1	sbn	sbn	http://pds.nasa.gov/pds4/sbn/v1	urn:nasa:pds:	Discipline	PDS SBN	
0001_NASA_PDS_1	sbn	sp	http://pds.nasa.gov/pds4/sp/v1	urn:nasa:pds:	Discipline	PDS SBN	
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0001_NASA_PDS_1	ppi	mvn	http://pds.nasa.gov/pds4/mission/mvn/v1	urn:nasa:pds:	Mission	PDS PPI Node	
0001_NASA_PDS_1	ppi	mvn	http://pds.nasa.gov/pds4/mvn/v1	urn:nasa:pds:	Mission	PDS PPI Node	
0001_NASA_PDS_1	sbn	bopps	http://pds.nasa.gov/pds4/mission/bopps/v1	urn:nasa:pds:	Mission	PDS SBN	

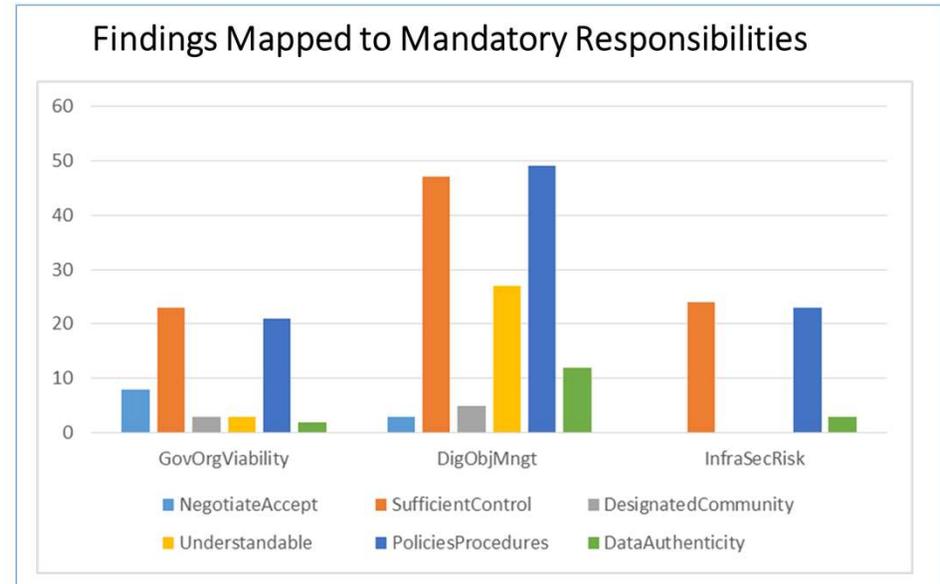


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Desk Audit – ISO 16363

- The assessment of PDS4 found that 92% of the metrics of the ISO 16363 standard were satisfied.
- 80% of the metrics for Governance and Organizational Viability
- 95% of the metrics for Digital Object Management
- 96% of the metrics for Infrastructure and Security Risk Management.



ISO 16363 Section	Satisfied Metrics	Unsatisfied Metrics	Total Metrics
Governance and Organizational Viability	20	5	25
Digital Object Management	57	3	60
Infrastructure and Security Risk Management	23	1	24
Total	100	9	109



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Maintaining Useful Data

- Data must be ***useful*** for future users
 - This requirement is usually considered to be most relevant to the value of the repository for its user communities
 - Remains largely subject to various interpretations and misunderstandings.



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Conclusions

- PDS4 allows the evolution of the information architecture to be independent of the software/services architecture.
 - Foundational principles are from the OAIS-RM.
 - Stays relevant through continued involvement of domain experts
 - Follows “agile” develop cycle with periodic delivery and testing
 - Results in an information model-driven architecture
- The Information Architecture is well-positioned to both scale and evolve to meet the future needs of the community.
- The IPDA and interactions with other space science communities increases interoperability.



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Thank You



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Backup



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Why be certified?

- To provide proof that the repository is doing a good job
- Help users make a choice between competitive repositories
- Instils confidence in depositors – so they are more likely to deposit
- Instils confidence in consumers – so they are likely to increase their usage and have greater trust in the information provided
- Instils confidence from upper management
- Instils confidence from funders – i.e. that they are not wasting their money
- Certification under ISO 16363 demonstrates and reinforces the repository's commitment to its mission.



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Dictionary Governance

- Registration Authority is an entity that has the authority and responsibility to govern one or more dictionaries.
- Steward is a entity consisting of a group of domain experts that is given authority and responsibility by a Registration Authority to govern (i.e., create and manage) one or more dictionaries within a domain area.
 - *One member of the group is identified as a primary steward.*
 - *The steward in general can create one or more namespaces within a domain.*
- Namespace is a “container” for a logical grouping under a single identifier of classes and attributes.



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Artifacts Generated From Model

